

## EDITORIAL ARTICLES.

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### IS RESECTION OF THE KNEE-JOINT JUSTIFIABLE IN CHILDREN?

Ever since Prof. Humphreys called attention to the fact that progressive relative shortening of the diseased limb almost invariably followed resection of the knee-joint in growing individuals, the attention of practical surgeons has been directed to this question, and more or less objection has been urged, based upon these observations against the performance of the operation in children. The now well established fact, however, that disease of the knee-joint itself is responsible for shortening in this class of cases, has been brought forward as an argument in favor of interference; for it may be said, with justice, that if shortening is to be apprehended in any event, it may as well follow an attempt to rid the little sufferer of its painful malady, as occur as a sequel to the unrestricted course of the disease.

Prior to the discovery of the bacillus tuberculosis by Koch, the theory was held as originally advanced by Robert, of Giesen, that circulatory disturbances, and particularly compression of the popliteal artery, formed a prominent factor in the causation of diminution of growth of the diseased limb in knee-joint disease. The demonstration of the presence of Koch's bacillus in the epiphyseal cartilages cast new light upon this class of cases, and led to a further study of their etiology. The interesting question, as to whether the progressive relative shortening resulting from tuberculosis of bone, and which pursues an unrestricted course, is not as important for our consideration as that following resection, now presents itself. If this can be answered in the affirmative, the only argument against resection of the knee-joint in children, will have been effectively disposed of.

As bearing upon this question, the recent study of a series of sixty-

three cases by F. Hitzegrad, of Kiel<sup>1</sup>, is of exceeding interest. These patients were examined after a period averaging five and one-half years following the operation, with a view of determining the amount of shortening present. Although but one examination was made, and therefore this study cannot be of as great value as if repeated examinations had been made during the five years, yet it is very suggestive in its results.

Eighteen cases in children from 1 to 10 years of age at the time of operation, showed ten to have a shortening, at the time of examination, of from one to five cm.; four of them from six to ten cm., while the remaining four exhibited a deficiency amounting from eleven to sixteen cm. Nineteen cases were in individuals eleven to seventeen years of age, and of these six showed a diminution of growth resulting in from one to five cm. shortening; thirteen had from six to ten cm. Of eleven patients above 18 years of age, nine had shortening of from one to five cm. and the remaining two from six to ten cm. It would appear from this that no period of life short of that which marks the completion of the growth of the individual can be selected as absolutely favorable for resection; although, it is reasonable to deduce, and logical to conclude, that the nearer one approaches to the adult, the less will be the difference in the length of the two limbs when growth ceases, other things being equal.

The point at which the section of the bone is made has heretofore entered largely into this question, and been supposed to govern, to a great extent, the prognosis as to functional disturbance to be anticipated in any given case. Referring again to the report of cases contributed by Hitzegrad, it is found that shortening of from one to five cm. existed in sixteen cases which had been subjected to intra-epiphyseal section, while in only two instances was this amount of shortening to be found in extra-epiphyseal section. Shortening of from six to ten cm. is recorded as having followed intra-epiphyseal section in seven cases, while the same amount of shortening occurred in six cases

<sup>1</sup>*Welcher Art sind die Enderfolge der Kniegelenksresektionen seit Einführung der antiseptischen Wundbehandlung und der künstlichen Blutleer.* Mittheilung aus der chirurg. Klinik zu Kiel; herausgegeben von F. V. Esmarch.

in which the resection was extra-epiphyseal. In five cases of extra-epiphyseal section the shortening amounted to from eleven to sixteen cm.; in only a single case did the shortening reach this extent in intra-epiphyseal resection.

The seemingly contradictory nature of these figures is only to be cleared up when the fact that Hitzegrad failed to take into account the amount of shortening present, and which resulted from the disease itself, at the time of the operation, is considered. It is to be noted, where the shortening was the least, as in the first eighteen cases, the greater number of cases of shortening occurred in those in which the epiphysis was not spared, while those in which the latter was not destroyed showed the advantage of this procedure, by giving a much smaller number of cases with a like amount of shortening. But in those instances in which shortening from six to ten cm. in extent occurred, the cases are found to be divided about equally between those in which the epiphysis was preserved, and those in which it was removed. Again, it will be observed that when extensive shortening was noted, upon only one occasion did this fall within the limits of from eleven to sixteen cm., following an intra-epiphyseal; resection on the other hand, this amount of shorting resulted five times after extra-epiphyseal section.

The failure of this observer to note, first, the amount of shortening existing at the time of the operation, and which was due to the destructive effect of the tuberculous disease upon the epiphyseal cartilages; and, second, the rapidly or otherwise progressive comparative shortening, which could only be determined by several examinations extending over the period during which the progressively relative lessening of the length continued, brings us at once to a consideration of these important points as they occur in the natural history of cases of tuberculous arthritis in children which pursue a course uninfluenced by treatment.

This question has been most carefully studied by Julius Dollinger, of Budapest.<sup>1</sup> Basing his observations upon examinations made at dif-

<sup>1</sup>*Das Zurückbleiben im Wachstume der kranken Extremität bei tuberkulöser Kniegelenkentzündung.* Ein Beitrag zur Berechtigungsfrage der Kniegelenkresektion im Kindesalter. Centralblatt für Chirurgie, No. 49, 897, 1888.

ferent times upon forty-one cases of tuberculosis of the knee-joint in children, he endeavors to answer the following queries:

1. At what period of time in a given case in which the inflammation is undisturbed by treatment, does relative shortening of the limb commence?

2. How great is this relative shortening after a certain number of years?

3. Does the relative shortening continue to increase after the arrest of the inflammation?

4. Is the growth of the diseased limb influenced by extension and use of the same?

Measurements of the diseased limbs were made as follows: The point of the trochanter was selected as one point of measurement in the case of the thigh, and the lower edge of the external condyle as the other. Those for the tibia were the upper edge of the tibia and the summit of the external malleolus. In order to meet the requirements necessary for question 4, measurements were made, in some instances, at different stages of the treatment by extension.

Several important facts have been brought to light by these observations of Dollinger. In the first place, it was shown that no period of time can be reliably stated in which the comparative shortening of the limb can be expected to begin. On the other hand, it is shown that as long as the active inflammation, or even hyperæmia lasts, just so long will the limb maintain its proper relation, as to length, with its fellow. In some instances, though this was found to be a rare occurrence, the diseased limb was found to undergo a more rapid growth, and become actually lengthened relatively to the extent of 1 to 1.5 cm. When the inflammatory irritation, however, comes to a standstill, or even ceases altogether, and when cicatricial contraction of the periarticular structures occurs, a greater or lesser number of the blood vessels in the neighborhood of the joint become obliterated, and the epiphyseal cartilage is insufficiently supplied with blood—then it is that the relative length of the diseased limb becomes diminished from arrested or retarded growth. The rationale of this may be readily understood when it is remembered that the normal growth of the

lower extremity depends mainly upon the epiphyseal cartilages in the neighborhood of the knee-joint.

The question as to the relative amount of shortening which is to be anticipated as occurring after the lapse of a certain time, cannot be answered by any hard and fast rule, or mathematical computation. That the difference in the length of the limb is not always in direct proportion to the number of years which has elapsed since the beginning of the inflammatory disturbance, can be stated, however, as a fact. The final results must necessarily depend, among other varying influences, upon the intensity of the inflammation, and the destructive influences of the same upon the nourishing apparatus of the epiphyseal cartilage.

The question as to whether or not the growth of the diseased limb is influenced by combined extension and use of the same is of exceedingly great interest to the practical surgeon. Inasmuch as it has been claimed that these measures of treatment are useful in so maintaining the nourishment of the extremity as to lessen decidedly the comparative amount of shortening of the diseased limb. Dollinger shows, and I believe this will be found to be in accord with the experience of most surgeons, although it is difficult to gather information upon this point, so far as his observations go, that in no instance was it demonstrated that differences existing at the time of the commencement of the treatment ever lessened. In some cases the relative shortening increased, although, as a rule, it remained stationary.

Taking these facts into consideration, the question of the justifiability of performing the operation of resection of the knee-joint in children can, in my opinion, be answered in the affirmative. It has been shown by Schüller<sup>1</sup> that tubercular inflammation of joints is characterized by the invasion and growth of the tubercle in the interior of the joint, and that this either has its origin in a tuberculous centre in the articular extremities of the bone, or proceeds primarily from the synovial membrane. This latter method of invasion, according to this writer, is the less frequent of the two, the proportion, in the case of the knee joint, being about two to one in favor of bone. The peculiarities

<sup>1</sup>*Die Pathologie und Therapie der Gelenkentzündungen.* Von Prof. Dr. Max Schüller in Berlin. Wien und Leipzig, 1887.

which characterise tuberculous inflammation in general are present in tubercular joint inflammation. These are, a chronically inflamed new tissue formation in the spongy and synovial tissues, which becomes infiltrated with tubercle; disintegration of existing normal tissue and tendency toward cheesy degeneration; infinite propagation of the tubercular inflammation in the surrounding and neighboring tissues from the original centre, and the occurrence, sooner or later, of constitutional symptoms, through the tubercular diathesis. In other words, we have to deal, in these cases, with what must be essentially looked upon as a form of disease progressive in its character, and which may, at any period of its existence, become as destructive to the individual as its prototype, carcinoma. The slow development of the disease, as a rule, seems to allay fears as to its serious character, until a sudden or acute accession of joint inflammation following a breaking through into the cavity of the articulation of a tuberculous centre, or a cheesy degeneration of tubercular centres within the synovial membrane, serve to awaken alarm, and lead to the instituting of more decided measures of relief. Prior to the occurrence of these, there may be no visible changes in or about the knee, and, save only some indefinite pain and a vague sense of uneasiness of the limb, or disturbance of function, there may be nothing to call attention to the joint. In the course of time, however, sometimes occupying months or even years, in a large proportion of cases, graver symptoms develop, and the question of operative interference, if it has not already occupied the surgeon's mind, is forced upon him. The importance of thoroughly eradicating the disease must be apparent, as well as the necessity, in order to accomplish this, of removing the joint surfaces *in toto*.

Extra-epiphyseal resection will be required in those instances in which the tuberculous deposit is found to extend to or above this line. It goes without saying that resection to this extent in cases in which this structure has not been invaded will certainly entail upon the patient, as a result of the operation, a disability proportionate to the extent which the diseased limb will have fallen behind its fellow when the individual has attained his full development. On the other hand, in those cases of resection for tuberculous disease of the knee joint, in

which the plates of epiphyseal cartilage can be preserved, shortening likewise occurs ; this latter resulting, not from the operation, but from the damage which the tuberculous process in the neighborhood of the epiphysis has inflicted upon the latter by interfering with its proper blood supply.

To sum up, therefore :

First. Observation and clinical experience show that tuberculous inflammation within or in the neighborhood of the knee joint, in children, leads to relative shortening of the limb, through interference with the blood supply to the epiphyseal cartilages.

Second. The amount of shortening of the limb present, when the patient reaches his full growth, will depend upon the extent to which the epiphyseal cartilages have been damaged and its bone-forming function destroyed by the presence of the tuberculous disease.

Third. Resection of the knee-joint in growing individuals is followed by relative shortening of the limb only in proportion as the line of the epiphysis has been invaded by the disease. The extent of the disease is the only guide for the surgeon to follow in determining the amount of tissue to be removed. Those cases in which the epiphysis is spared, and in which the ultimate relative shortening is found to be considerable, are cases in which the damaging effects of the disease are responsible for the functional disability, and not the operation.

Fourth. Resection of the knee-joint in children is justifiable. Attempts to preserve the epiphyseal cartilages where the latter are actually invaded by the tuberculous process can hold out no hope of lessening the ultimate relative shortening, and will almost certainly lead to a recurrence of the disease and the necessity for final amputation.

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#### THE TREATMENT OF GANGRENOUS HERNIA AND ARTIFICIAL ANUS<sup>1</sup>

This question of the treatment of the intestine in a gangrenous her-

<sup>1</sup>A Comparison of Old and New Methods in the Treatment of Gangrenous Hernia and Artificial Anus. By Dr. W. KORTE (Berlin).—*Deutsche Med. Wochenschrift*, No. 41, 1888.